

movement, said apparatus comprising:

(1) means mounted to said vehicle for indicating the loading of material into a dump body of said vehicle;

(2) means mounted to said vehicle for indicating the dumping of the load carried by said body;

(3) means mounted to said vehicle for indicating the direction of movement by said vehicle;

a processor means on-board said vehicle for acquiring data generated from means (1), (2) and (3) and organizing said acquired data for downloading to a remote control center; and

(4) means for sending said acquired data to said remote control center and for receiving control signals therefrom.

104. An apparatus as set forth in claim 103 wherein said means (1) comprises a bi-state switch positioned in a recess of a bed of said dump body so as to detect the presence of material carried in said dump body.

Sub D22 105. An apparatus as set forth in claim 103 wherein said means (1) comprises a pressure sensor assembly mounted to a frame of said vehicle for transferring from said dump body to said frame at least a predetermined portion of the total weight of said dump body in a substantially uniform manner along an interface between said frame and said dump body and said assembly is responsive to said predetermined portion of the total weight to provide pressure data representative of the weight of said dump body.

Amend the following claims:

Sub C *Sub D2* 2. An apparatus as set forth in claim [1] 105 wherein said processor means includes 1) memory means for storing data indicative of a predetermined maximum weight capacity for said [truck] dump body, 2) detection means responsive to incremental increases in the total weight of said [truck] dump body for determining the approximate weight of material added by a bucket of a loader, 3) comparison means responsive to said memory, processor and detection means for determining if the total weight

minus said predetermined maximum weight for said [truck] dump body is a fraction of the approximate weight of material in said bucket, and 4) display means responsive to said comparison means for displaying the remaining weight capacity of said [truck] dump body.

3. An apparatus as set forth in claim 2 wherein said detection means includes;

first means for detecting a monotonic increase in the total weight of said [truck] dump body; and

second means for storing said increase.

Sub D 3
4. An apparatus as set forth in claim 2 wherein said processor means includes means for isolating pressure data representing pressure spikes and means for recording the occurrence of a pressure spike, and means responsive to the recording means for delivering data to said display means indicative of the degree of road roughness.

5. An apparatus as set forth in claim 2 wherein said display means includes a display of the remaining weight capacity of said [truck] dump body as a percentage of the approximate weight of material carried by said bucket.

6. An apparatus as set forth in claim 5 wherein said display means comprises a series of light indicators representative of the approximate capacity of a bucket, said light indicators being relatively positioned such that each light represents a fractional portion of the capacity of the bucket.

7. An apparatus as set forth in claim 2 wherein said pressure sensor assembly is also a cushioning interface between said [truck] dump body and said [truck] frame.

Sub D 4
8. An apparatus as set forth in claim 2 wherein said body is pivotally mounted to said frame by way of a hinge assembly such that said pressure sensor assembly supports the entire weight of said [truck] dump body in its lowered position on said [truck] frame along the interface between said [truck] frame and

dump body with none of the weight of the load transferred to the [truck] frame via said hinge assembly.

9. An apparatus as set forth in claim 8 wherein said hinge assembly has body and frame portions and also has means for decoupling said body and frame portions when said [truck] dump body is moved to its lowered position such that the entire weight of said [truck] dump body is communicated to said [truck] frame through said pressure sensor assembly.

10. An apparatus as set forth in claim [1] 105 wherein said pressure sensor assembly comprises at least one length of resilient tubing positioned on a beam of said [truck] frame wherein said resilient tubing provides an interface between said [truck] dump body and said [truck] frame for communicating said at least predetermined portion of the weight of said dump body to said frame.

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11. An apparatus as set forth in claim [1] 105 including:
first transceiver means mounted to each of said plurality of [trucks] vehicles;

said processor means mounted to said [truck] vehicle and said processor means operatively coupled to said first transceiver means and said pressure sensor assembly for receiving said data from said pressure sensor assembly, processing said data and transmitting data signals indicative of the [truck's] vehicle's hauling status by way of said transceiver; and

said control center including a stationary processor means [including] having a second transceiver means for communicating with said first transceiver means, said stationary processor means receiving said data signals from said processor means, said data signals identifying the [truck] vehicle and its hauling status.

12. An apparatus as set forth in claim 11 wherein
said stationary processor means includes 1) first means for calculating in response to said data signals an average load time for each loader, 2) second means responsive to said data and said first means for calculating the current load delay time for each

loader, 3) third means for identifying the loader with the minimum load delay 4) fourth means for forming data for transmission by said second transceiver means, said data identifying a particular [truck] vehicle and the loader with the minimum load delay time; and

said processor means mounted to said [truck] vehicle including fifth means responsive to data received from said fourth means by said first transceiver for displaying the number of the loader identified by the data to the operator of the [truck] vehicle identified by the data.

13. An apparatus as set forth in claim 11 wherein said pressure sensor assembly includes tubings which forms the interface between each of said body and frame of said [trucks] vehicle.

14. An apparatus as set forth in claim 11 wherein said stationary processor means includes memory means for archiving data from said [trucks] vehicle.

15. An apparatus as set forth in claim 11 wherein said processor means generates data signals for transmission in response to data from said pressure sensor assembly which are indicative of whether said [truck] vehicle is dumping its load, beginning loading of a new load or in transit between load and dump sites.

16. An apparatus as set forth in claim 15 wherein said processor means generates data signals for transmission in response to data a plurality of sensors on-board said [trucks] vehicles including gear sensors, dump sensors and distance sensors.

17. An apparatus as set forth in claim 11 wherein said stationary processor means includes memory means for archiving said data signals from each of said plurality of processors in groups firstly identifiable with individual trucks and secondly identifiable with types of [trucks] vehicles.

18. An apparatus as set forth in claim 17 wherein the data

base formed by the data archived in said memory means is used by said stationary processor means to generate data for controlling the movement of said [truck] vehicle by transmitting said control data for reception by said first transceiver.

19. An apparatus as set forth in claim [1] 105 wherein said processor means includes:

means for periodically sampling the pressure data from said pressure sensor assembly;

storing said data;

means for periodically comparing a selected one of said data samples with other stored samples to determine if said one of said data samples is a pressure spike;

means for counting the pressure spikes; and

means for deriving from the total count of pressure spikes an indication of the degree of road roughness and displaying said indication on display means.

20. An apparatus as set forth in claim [1] 105 including:

said processor means providing an indication of a load or dump condition of said [truck] vehicle in response to pressure data from said pressure sensor assembly;

distance means for measuring the distance traveled by said [truck] vehicle between load and dump indications from said processor means;

storage means responsive to said distance means and said pressure sensor assembly for storing the distance traveled by said [truck] vehicle between load and dump sites and for storing the total weight of the load hauled by said [truck] vehicle between sites; and

means responsive to the storage means for multiplying the distance traveled by the weight hauled in order to provide a tons miles record.

21. An apparatus as set forth in claim 20 including, means for transmitting to a remote location the value resulting from the multiplying means where the value is divided by the time

interval between successive load and dump indications thereby providing a standard for the degree of tire load.

22. An apparatus according to claim [1] 105 wherein said apparatus identifies a reference number and records vital statistics of the [truck] vehicle in connection with said reference number, said apparatus includes:

memory means operatively coupled to said processor means;

means coupled to said processor means for entering said reference number and for identifying a portion of said memory means corresponding to said reference number;

said processor means responsive to said pressure data for 1) manipulating said data and 2) routing said manipulated data to locations within said portion of said memory identified by said entering means;

detecting means responsive to said entering means for detecting changes in the reference number; and

display means responsive to said detecting means for displaying the manipulated data in said portion of memory when a change of said reference number has occurred.

23. An apparatus according to claim 11 including:

said stationary processor means including memory means for storing a predetermined maximum load capacity for each of said [truck] dump bodies; and

said processor means including means for determining a weight of said [truck] dump body from the data of said pressure sensor assembly indicative of the weight of the load, each of said processor means transmitting data to said stationary process or means which is indicative of the total weight of the [truck] dump body,

said stationary processor means 1) comparing the weight with the predetermined maximum load capacity, and 2) generating an output signal identifying the [truck] vehicle if the weight is greater than the predetermined maximum load capacity.

24. An apparatus as set forth in claim [1] 105 including

means for displaying the weight of said [truck] dump body in response to said processor means.

25. An apparatus as set forth in claim 23 including means in said stationary processor means for accumulating the total number of times an output signal is generated indicating an overload of the [truck] vehicle.

26. An apparatus as set forth in claim [1] 105 including means for measuring the front and rear axle loads of said [truck] vehicle wherein said dump body is pivotally mounted to said frame, said means comprising:

a weighing device on said [truck] vehicle distinct from said pressure sensor assembly for measuring a force of said [truck] dump body on said [truck] frame and providing data indicative of said force;

a processor means responsive to the data from said weighing device and said pressure sensor assembly for determining the distribution of the weight of said [truck] dump body over the front and rear axles of said [truck] vehicle; and

display means responsive to said processor means for displaying the portions of the weight of said [truck] dump body carried by said front and rear axles.

27. An apparatus as set forth in claim 26 wherein hydraulic cylinders connected between said [truck] frame and dump body move said [truck] dump body between said raised and lowered positions, said weighing device sensing the pressure in the hydraulic fluid of said hydraulic cylinder.

28. An apparatus as set forth in claim 26 wherein said processor means includes means for finding the relative location of the center of gravity of a loaded [truck] dump body between said front and rear axles.

29. An apparatus as set forth in claim 26 wherein said processor means includes memory means storing predetermined tare weights for said front and rear axles and said processor means including summing means for adding the axle weight to the tare

weight in order to find a gross weight for each axle.

30. An apparatus as set forth in claim [1] 105, wherein said [truck] dump body is pivotal between raised and lowered positions on said [truck] dump body and where said pressure sensor assembly mounted on said [truck] frame includes a plurality of sensor elements and said sensor assembly provides an interface between said [truck] frame and dump body when said dump body is in a lowered position such that said plurality of sensor elements taken as a whole provide an indication of the total weight of said [truck] dump body and when taken in groups comprising less than the whole and thereby provide an indication of fore-and-aft weight distribution as well as side-to-side weight distribution of the load carried by the [truck] dump body; and

said processor means having means responsive to said groups of sensor elements of said pressure sensor assembly for detecting an imbalance of the weight carried by said [truck] dump body and signaling the [truck] vehicle operator in response thereto.

31. An apparatus as set forth in claim [1] 105 wherein [said body is pivotally mounted to said truck frame and said apparatus includes a distance sensor for providing signals to said processor means indicative of truck movement,] said processor means including means responsive to said [distance sensor] means (3) and to said pressure sensor assembly for providing an output signal when said [truck] vehicle moves without the dump body in its fully lowered position.

32. An apparatus as set forth in claim [1] 105 wherein said dump body is pivotally between raised and lowered positions and wherein said processor means includes 1) memory means for storing the tare weight of said [truck] dump body, 2) means responsive to the lowering of said [truck] dump body onto said pressure sensor assembly after the load carried by said dump body has been dumped for comparing the weight of said [truck] dump body with the tare weight in said memory, and 3) means for indicating the dump body is not fully empty when the weight of the dump body is greater than the tare weight of the dump body plus a predetermined constant.